



Comments on the Draft IRP 2016

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*23 January 2017, Kimberley,
Northern Cape Province (South Africa's Mecca for
CSP Power Stations)*



Energy Minister Tina Joemat-Pettersson, reaffirmed Northern Cape Province as the "country's Mecca for the development of renewable energy sources...it is not surprising that the province hosts 100% of the Concentrated Solar Power (CSP)... procured in bid windows to date"

Source & Image : Engineering News, 15 April 2016, reporting on the Minister of Energy's speech at the inauguration of the De Aar 3 solar project in the Northern Cape

1. SASTELA - Introduction & Objectives
2. Status of the deployment and development of CSP projects in South Africa
3. Current CSP Procurement Framework and costs/tariffs in South Africa
4. CSP cost assumptions used in the Draft IRP 2016
5. CSP Value to the power system and contribution to foreign direct investment
6. Conclusions and Recommendations

1: SASTELA'S - Objectives

- ❖ Promote the roll out of flexible **CSP Power Stations** for the production of sustainable **peak, mid merit** and **baseload** solar thermal electricity in Southern Africa.
- ❖ Highlight and support the use of **solar steam** for industrial applications and energy efficiency.
- ❖ Promote CSP in Southern Africa at policy and administrative levels (local, national, regional & international) aimed at harnessing the region's vast **Solar Resource**.
- ❖ Promote the **manufacture and industrialisation of CSP components** in Southern Africa, where SADC **countries** can manufacture different CSP components for flexible Solar Thermal Power Stations.

2: Status of CSP in South Africa – Programmes



energy

Department:
Energy
REPUBLIC OF SOUTH AFRICA

- ❖ Department of Energy,
Renewable Energy
Independent Power
Producer Programme
(REIPPP)



- ❖ Eskom, CSP Programme

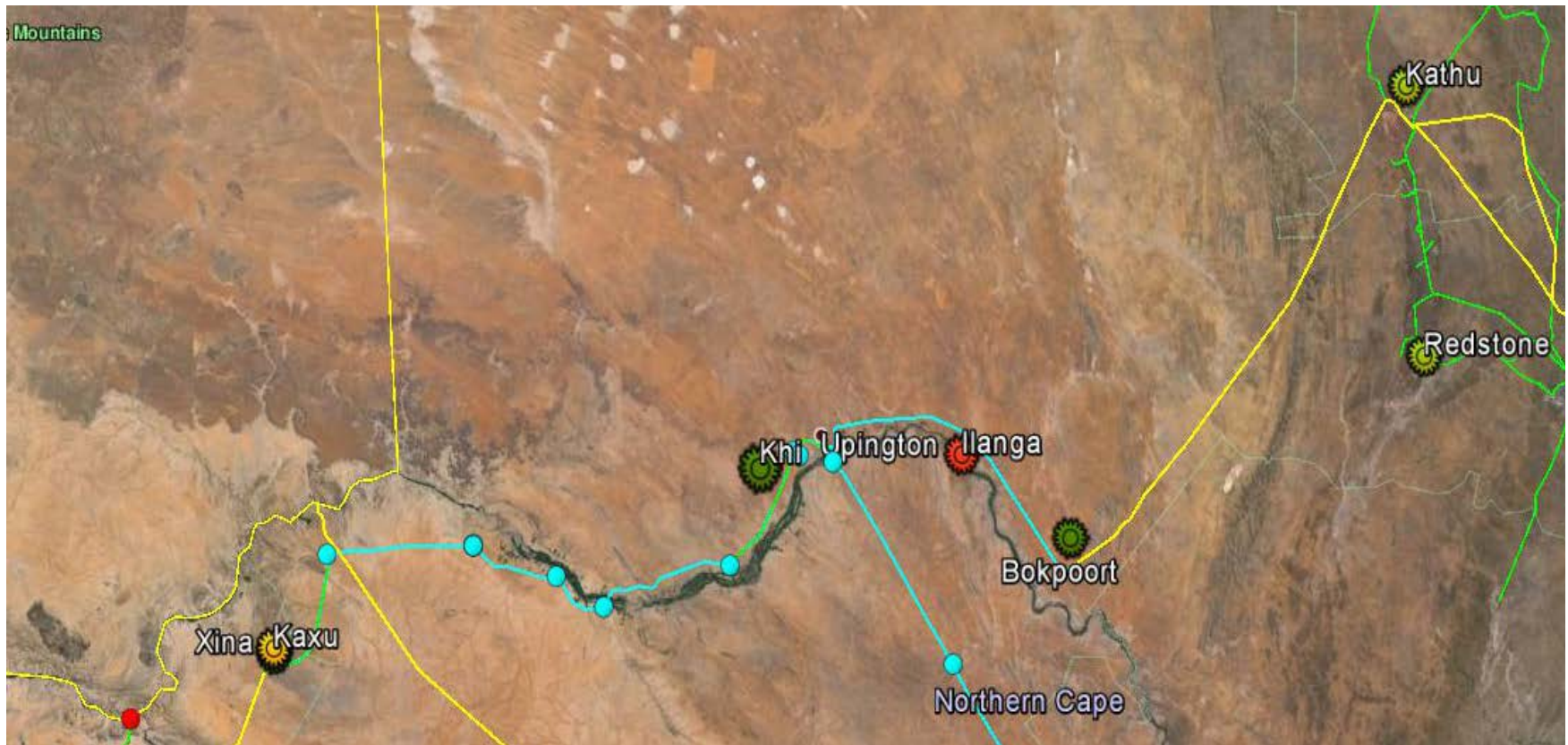
2.1: Status of CSP in South Africa - REIPPP

BW1	BW2	BW3	BW3.5	BW4	Expedited
· 28 Preferred Bidders	· 19 Preferred Bidders	· 17 Preferred Bidders	· 2 Preferred Bidders	· 26 Preferred Bidders	· Bid Nov '15
· 1425MW allocated	· 1040MW allocated	· 1456MW allocated	· 200MW allocated	· 2205MW allocated	· 1800MW available
· 150MW CSP	· 50MW CSP	· 200MW CSP	· 200MW CSP	· 0 CSP	· 450MW CSP

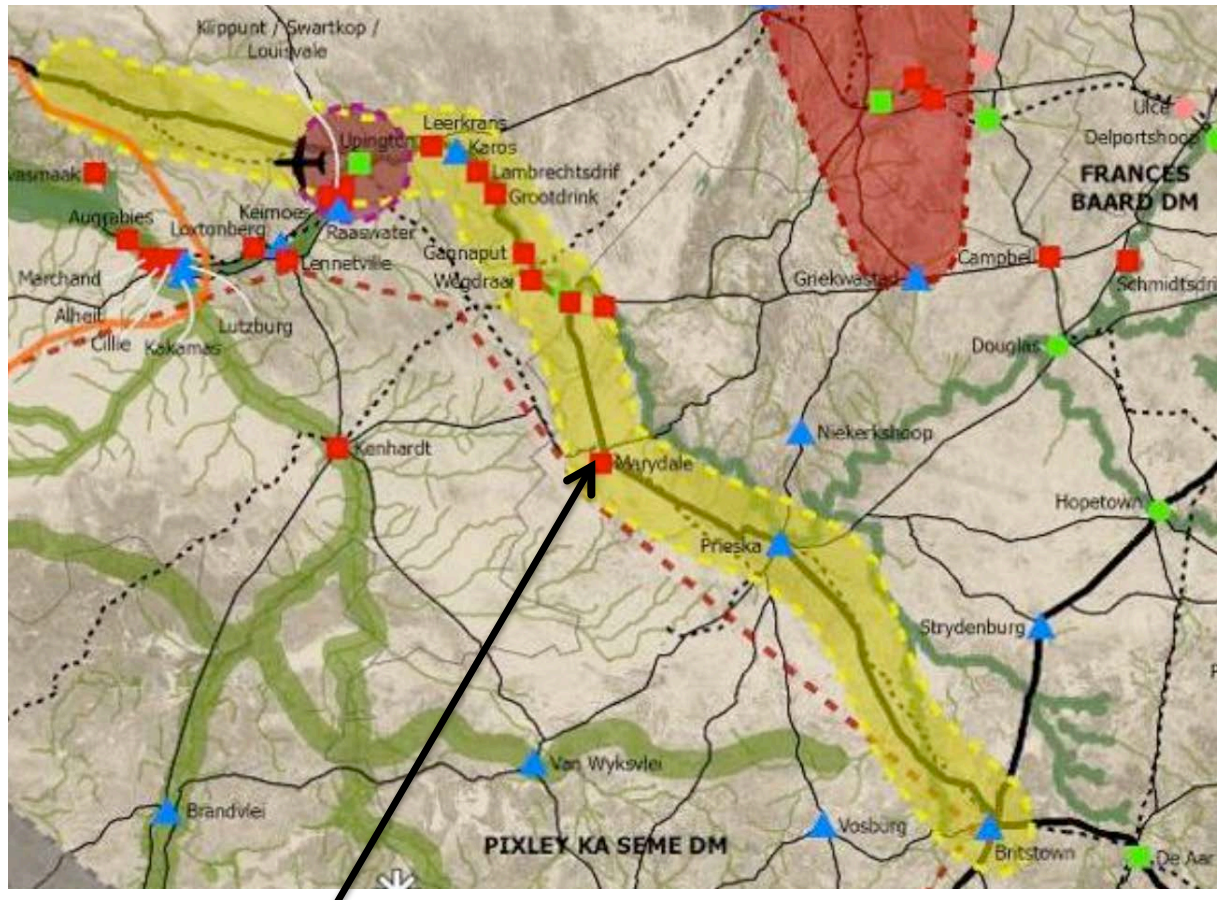
- ❖ Some 6326MW of RE in total selected as Preferred Bidders in the DOE programme.
- ❖ 600MW CSP selected since 2011, 150MW being towers and 450MW parabolic troughs.
- ❖ 9 Projects submitted in Bid Window Expedited with a combined total of 1350 MW.
- ❖ CSP < 10% of allocation.

2.1.1: Status of CSP in SA - REIPPP Deployment

- ❖ Operation - Kaxu (100MW Trough), Khi (50MW Tower), Bokpoort (50MW Trough)
- ❖ Construction - Ilanga 100MW, Xina 100MW, Kathu 100MW (all Troughs)
- ❖ Financial Close (Awaiting PPA Signature) - Redstone 100MW Tower



2.1.2: Status of CSP in SA - Developments



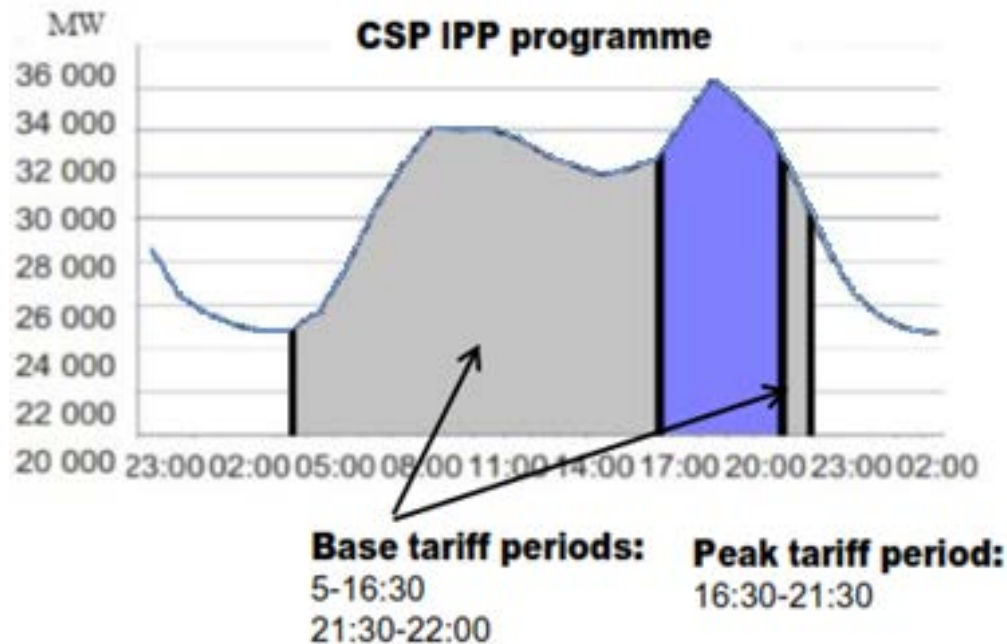
Over 4GW of CSP project developments in the Northern Cape Solar Corridor (Orange Territory) - Source : Northern Cape Spatial Development Plan 2012. The over 4GW developments were partly triggered by visibility of the revised CSP allocation in Draft IRP 2013 Update and various Government statements of 17 GW of renewables by 2030

2.2: Status of CSP in South Africa - Eskom



- ❖ *100 MW CSP Tower Demonstration Project - US \$3.75 billion*
Funding from the World Bank in place to "co-finance Medupi power station and the country's first large wind and concentrated solar power (CSP) projects" Source: Press Release issued by, Government of the Republic of South Africa : 09 April 2010
- ❖ *"Eskom's future CSP plans (to 2030) - It is Eskom's intention to build a fleet of plant, based on the learning attained from the construction and operation of the demonstration plant. The capacity of such a fleet in accordance with, and in support of, the Integrated Resource Plan South Africa. Source : Eskom website www.eskom.co.za*

3.0 Current CSP Procurement Framework



- ❖ The procurement emphasis from Bid Window 3 moved to the most value add for CSP; **producing competitive peak power** from 16:30 to 21:30, when electricity demand is the highest in South Africa.

3.1 Current CSP Costs/Tariffs in South Africa

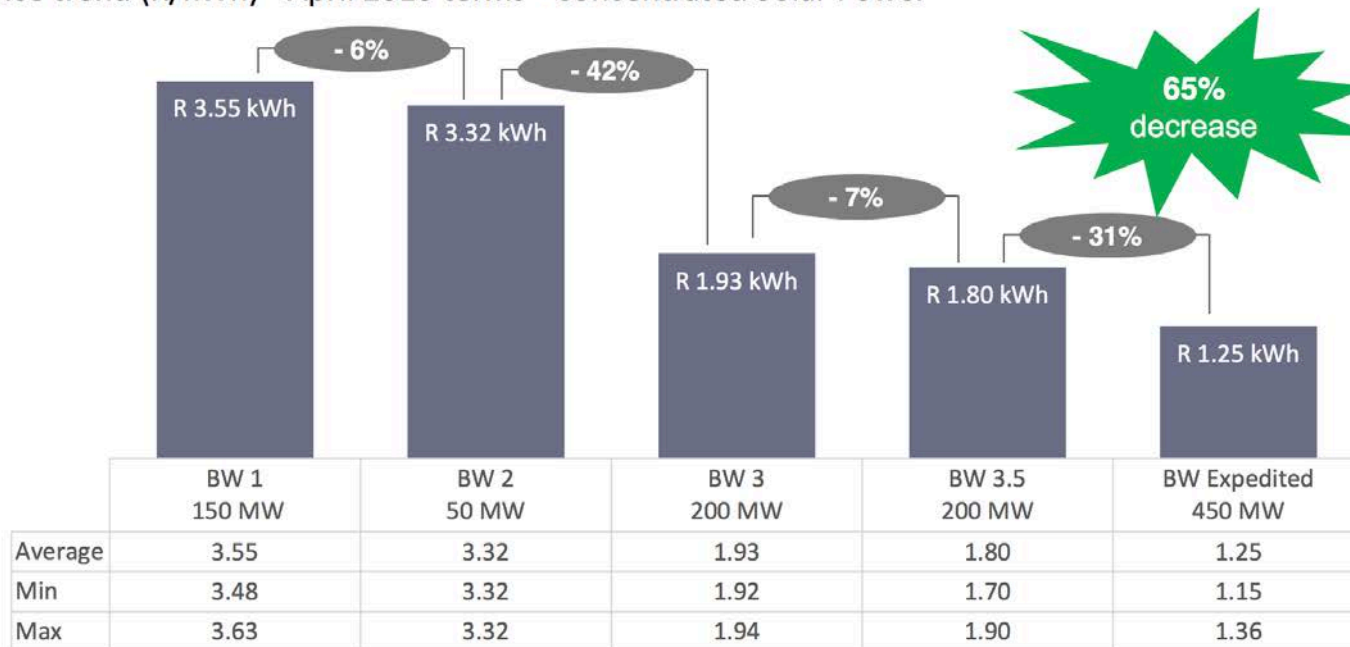


Independent Power Producer Office

Source: <http://www.energy.gov.za/files/renewable-energy-status-report/Market-Overview-and-Current-Levels-of-Renewable-Energy-Deployment-NERSA.pdf>

CSP Price Trend

Price trend (R/kWh) - April 2016 terms - Concentrated Solar Power

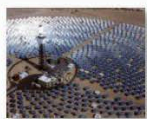


Note: All tariffs are contracted to increase by CPI or less per annum over the PPA term. Further tariff reductions are possible through refinancing i.e. sharing of the refinancing gain with consumers. It should also note that BW1 and BW2 cannot be compared with the BW3 and later bid windows due to a structural change.

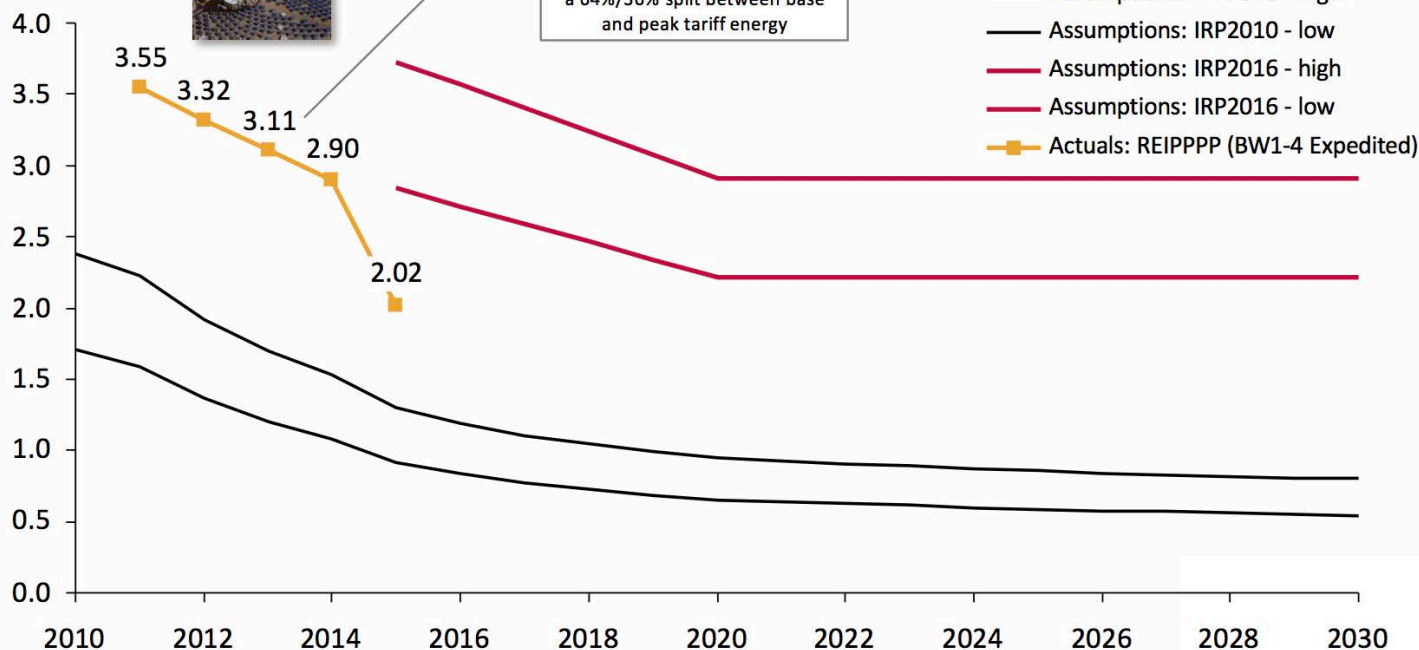
4.0 CSP costs/tariff assumptions IRP 2016

Actual CSP tariffs are declining from bid window 1 to 4 Expedited, and are now close to the upper boundary of IRP 2013 cost assumptions

Tariff in R/kWh
(Apr-2016-Rand)



Weighted average tariff for Bid Window 3, 3.5 and 4 Expedited calculated on the assumption of a 64%/36% split between base and peak tariff energy



Assumptions: CPI used for normalisation to Apr-2016-Rand; LCOE calculated for IRP 2010 and 2013 with 8% discount rate (real), 30 yrs lifetime, cost and load factor assumptions as per relevant IRP document; LCOE for IRP 2016 straight from IRP document; "IRP Tariff" then calculated assuming 90% of total tariff to be LCOE EPC costs, i.e. divide the LCOE by 0.9 to derive at the "IRP Tariff"
Sources: IRP 2010; IRP 2013; IRP 2016 draft as of November 2016; <http://www.energy.gov.za/files/renewable-energy-status-report/Market-Overview-and-Current-Levels-of-Renewable-Energy-Deployment-NERSA.pdf>; CSIR analysis

5.0: CSP Value to the power system

- ❖ CSP, with integrated thermal energy storage, provides locally resourced dispatchable and flexible electricity that complements variable (non-dispatchable) electricity generation allowing higher penetration of low cost electricity from wind farms and PV plants.
- ❖ CSP will reduce the exposure to the risk of cost escalation of imported diesel, natural gas, and/or locally sourced shale gas. The price of imported natural gas may be volatile due to the fluctuation of the international price of gas/oil as well as the Rand/Dollar exchange rate.

Source: The Role and Value of CSP in the South African Power System Workshop; 16 January 2017

5.1: CSP Contribution to inward investments



- ❖ The REIPPP has attracted an investment of R192 billion for 92 energy infrastructure projects (6236 MW) in bid windows 1, 2, 3, 3.5 and 4. R53 billion of the R192 billion invested to date comes from the 7 CSP projects (600 MW) approved to date.
- ❖ With only 600MW of approved CSP projects in 5 years, the South African CSP industry has advanced to a stage of maturity with demonstrated increases to local content beyond REIPPP program goals. It is vitally important that the IRP has an appropriate allocation of CSP to sustain and grow the local CSP industry and attract Foreign Direct Investments.

Source: The Role and Value of CSP in the South African Power System Workshop; 16 January 2017

6.0: Conclusions & Recommendations

- ❖ The current cost assumptions for CSP in the IRP modelling is not aligned with the actual price in the REIPPP Bid Window 4 Expedited round.
- ❖ The input for the IRP modelling assumed a cost of R 2.34/kWh and only reduces to ~R 2.20/kWh by 2030 while the average price in BW 4 Expedited for CSP was already ~R 2.00/kWh (based on a base tariff of R 1.25/kWh).
- ❖ CSP must be modelled as a flexible electricity generator, as is the case of most other system-dispatch technologies (OCGT, CCGT, coal, etc.), to capture the full value that it could provide to the South African power system.
- ❖ The PPA duration of 20 years for CSP does not reflect the economic life of the plant. We recommend a 30 to 35 year PPA

6.1: Conclusions & Recommendations

- ❖ Revise the calculation model which determines the most efficient generation mix taking into account, not only the cost but the value approach for all technologies.
- ❖ The price of CSP electricity is coming down globally and could reach 90c/kWh (6US\$cents/kWh) before 2030. Similar cost reductions could be expected in SA with a sufficiently large allocation in the IRP 2016. We recommend as per;
 - ❖ The SGW Solar Park/Corridor Scenario in the Draft IRP 2013 Update, for the DOE to allocate SGW of CSP (1000 per year from 2020 to 2025)
 - ❖ The SGW Solar Park/Corridor approach allowing bidders to bid multiple projects will drive down the cost of CSP at a rapid pace and (~R 90c/kWh (6US\$cents/kWh) could be achieved by 2025 from plants with 6,000 Full Load Hours (~60% Capacity Factor)
 - ❖ Based on today's figures, a SGW deployment of CSP from 2020 to 2025 could attract ~R400 billion of Foreign Direct Investment for CSP Projects alone.

6.2: Conclusions & Recommendations

- ❖ To meet South Africa's developmental challenges and international commitments - We recommend that a Final Policy Adjusted IRP 2016 that includes all technologies and CSP is prepared for presentation to cabinet.
- ❖ This is vital for any long-term plan for the following reasons:
 1. It gives developers, technology suppliers/innovators, industry, academia/ research institutions and long-term investors visibility to plan for the future, to stay in the game and to continue with innovations that will drive costs downwards.
 2. It provides the country with a diverse generation mix that can be procured at an appropriate time, at relevant tariffs at the time of procurement by the IPP Office.
 3. It does not close the door on any technology, it leaves the door open for the country to become a global leader on the deployment and industrialisation of any of the technologies in the mix, hence it is strategically key as a country to have CSP as part of the long term plan (2016 - 2050).



Thank you

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